United States Patent

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[54] **CHAIN THREAD SEVERER WITH LIGHT SOURCE AND PHOTOCELL HAVING RELATIVE RECIPROCAL MOVEMENT**
4 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **250/223,** 250/219, 112/130, 112/252
[51] **Int. Cl.** **G06m 7/00**
[50] **Field of Search** ..... 250/219 (S), 222, 223, 224; 112/130, 252

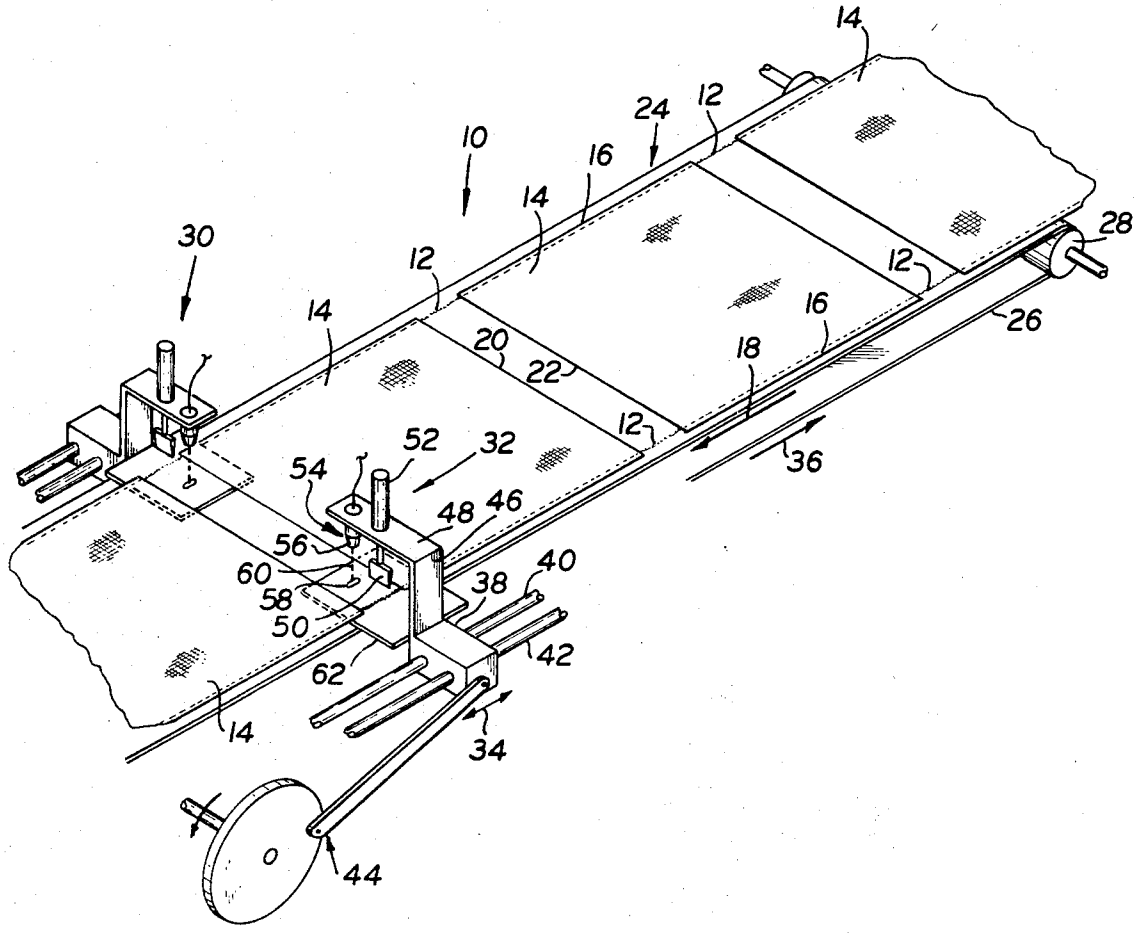
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ABSTRACT: A device for cutting chain thread, such as results from a prior sewing operation, which interconnects the trailing and leading edges of handkerchiefs or the like. The cutting mechanism initially moves in the feed direction with the handkerchiefs, which movement effectively both enlarges the opening between adjacent handkerchiefs and pulls the chain thread taut and then subsequently moves in a counterfeed direction across the opening, during which time it effectively severs the taut chain thread.



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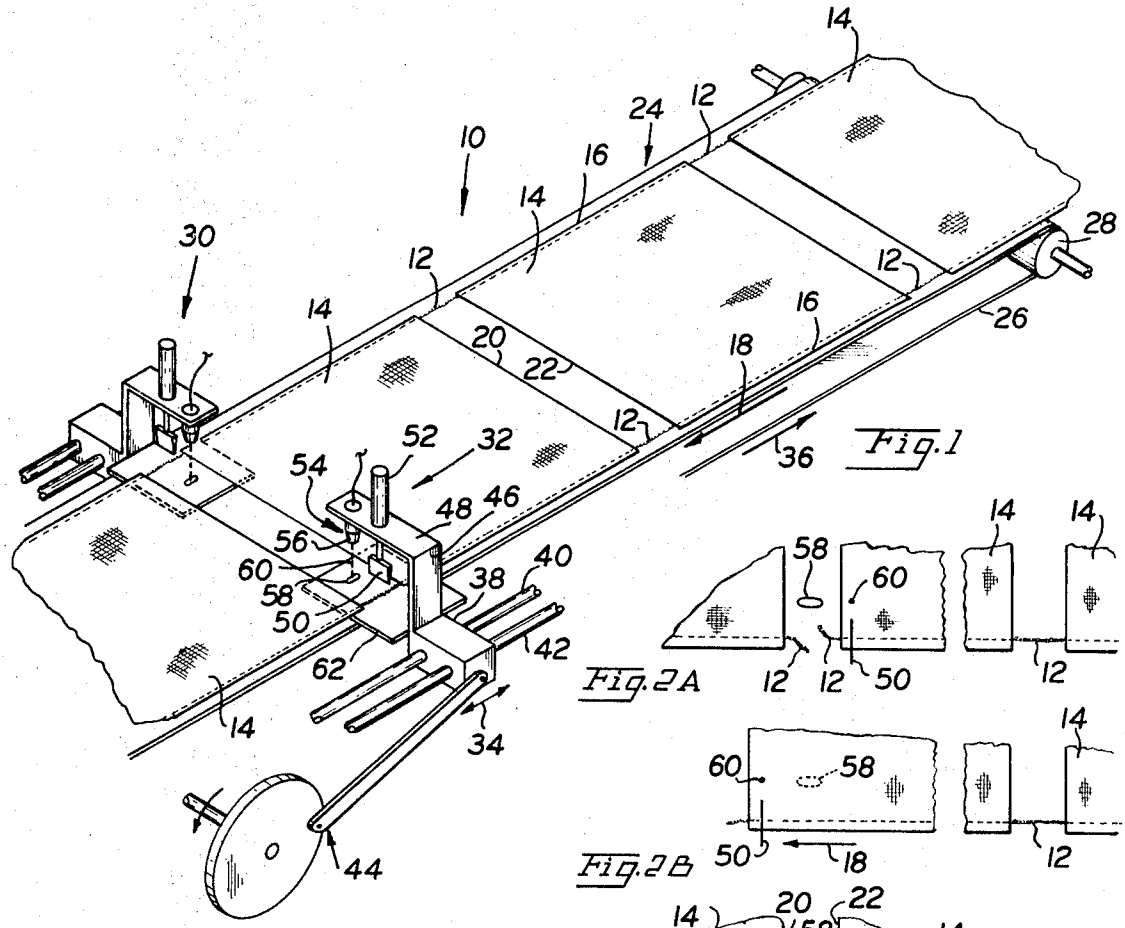


Fig. 1

Fig. 2A

Fig. 2B

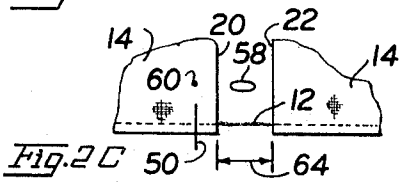


Fig. 2C

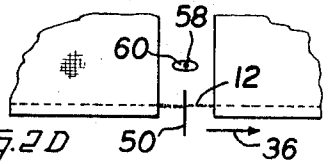


Fig. 2D

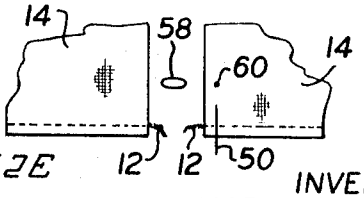


Fig. 2E

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CHAIN THREAD SEVERER WITH LIGHT SOURCE AND PHOTOCELL HAVING RELATIVE RECIPROCAL MOVEMENT

The present invention relates generally to sewing thread cutting devices, and more particularly to an improved chain thread severing device.

In mass production sewing operations, such as for example the hemming of handkerchiefs or like cloth blanks, the blanks are fed through the sewing station resulting not only in the deposit of the thread in the cloth but also in continuations of this thread extending in an interconnecting relation between adjacent blanks. Economic mass production does not permit terminating the sewing operation of the sewing machines to eliminate this so-called chain thread, and thus it must subsequently be severed preparatory to further processing of the individual handkerchiefs. In some instances, in fact, the chain thread is required not only to be severed but, for appearance's sake, it must be trimmed close to the handkerchief edges. There is thus a need for effectively achieving chain thread severing and trimming. While there are numerous thread cutters available, there is none which operates in such a controlled manner as to enable thread trimming close to the product edges and, thus, such trimming is usually done manually.

Broadly, it is an object of the present invention to provide an improved chain thread severing device overcoming the foregoing and other shortcomings of the prior art. Specifically, it is an object to provide a chain thread severing device, in the operation of which, the chain thread is so conditioned that severing is achieved at one or more precise locations. The severing device is accordingly also readily usable for trimming.

A device for severing sewing thread demonstrating objects and advantages of the present invention includes a cutting mechanism arranged for reciprocating movement parallel to the feed direction of movement of the interconnected handkerchiefs or the like. Thus, initially the cutting mechanism moves with the handkerchiefs to a starting position for a subsequent cutting stroke, while the same movement of the handkerchiefs is effective in pulling the chain thread taut between the handkerchiefs. The taut thread, which by virtue of its taut condition is in a predictable location and of a predictable length, is then severed or trimmed, as desired, as the cutting mechanism moves in a counterfeed direction through its cutting stroke.

The above brief description, as well as further objects, features and advantages of the present invention, will be more fully appreciated by reference to the following detailed description of a presently preferred, but nonetheless illustrative embodiment in accordance with the present invention, when taken in conjunction with the accompanying drawings, wherein:

FIG. **1** is a perspective view of a chain thread severing device according to the present invention;

FIGS. **2***a*—**2***e* are plan views illustrating a typical cycle of operation of the device. Specifically, FIGS. **2***a*—**2***c* illustrate the movement of the trailing and leading edges of chain thread connected cloth blanks through feed movement preparatory to the severing of the chain thread, and FIGS. **2***d* and **2***e* illustrate movement of the severing device per se in a counterfeed direction during which cutting or severing of the chain thread is achieved.

Reference is now made to the drawings wherein there is shown a thread severing device, generally designated **10**, demonstrating objects and advantages of the present invention. The device **10** is specifically useful in severing sewing or so-called chain thread **12** which results from typical sewing operations employed to finish cloth blanks **14**, which may be handkerchiefs, scarves or other like items. Specifically, at a sewing station (not illustrated) the sewing thread may be deposited along the edges of the blanks **14** to produce hems **16** and thus finished edges on opposite sides of the blanks **14**. Consistent with economic mass production, the sewing operation is not terminated as each successive blank **14** is carried in a feed direction **18** past the sewing needles, but rather said sewing operation continues and thereby produces chain thread lengths **12** which interconnect the trailing edge **20** with the leading edge **22** of adjacent blanks **14**. It is the essential function of the device **10** to cause severing or cutting of this chain thread **12**.

Device **10** includes a conveyor **24**, preferably in the form of an endless belt **26** appropriately entrained about supporting rollers **28** located at its opposite ends. As clearly illustrated in FIG. **1**, the upper run of the belt **26** is effective in carrying a succession of interconnected blanks **14** in the previously noted feed direction **18**, which direction it will be understood carries the blanks **14** towards two identically constructed cutting mechanisms **30** and **32**. For brevity's sake, only the construction and operation of cutting mechanism **32** will be described.

Cutting mechanism **32** is mounted for reciprocating movement in the feed direction **18** and also in the opposite counterfeed direction **36**, by virtue of including a bracket **38** appropriately mounted for sliding movement on guide rods **40** and **42** oriented parallel to the longitudinal dimension of the conveyor **24**. A crank mechanism **44** is connected to the bracket **38**, in the manner clearly illustrated in FIG. **1**, so as to impart reciprocating movement **34** to the cutting mechanism **32**.

Bracket **38** terminates in an L-shaped arrangement of arms **46** and **48**, the latter arm **48** extending in a clearance position over the marginal edges of the blanks **14**. Specifically, arm **48** includes a vertically oriented cutting implement or cutter **50** which is located directly above the path of movement of the chain thread **12**. That is, cutter **50** has a cutting edge oriented transversely of the location occupied by the chain thread **12** as each successive length thereof is carried by the conveyor **24** past the cutting station defined by each of the cutting mechanisms **30**, **32**. Each cutter **50** is preferably actuated through a vertical cutting stroke by a pressure air cylinder **52**, the return stroke of the cutter being achieved through the urgency of a return spring (not shown) upon the venting of the pressure air to atmosphere.

Mounted at the extreme free end of the arm **48** is a photocell control circuit **54** including a downwardly directed light source **56** and a cooperating photocell **58**. Operating in a manner which is well understood, whenever the light beam **60** is permitted to impinge upon the photocell **58**, this results in the closing of the circuit **54** with the further result that the cutter **50** is actuated by the cylinder **52** through a downward cutting stroke against a cutting plate **62** which extends horizontally from the base of the arm **46** in a protective position over the marginal edges of the upper run of the conveyor belt **26**. Naturally, any interposed chain thread **12** which is contacted by the cutter **50** as it comes down against the cutting plate **62** is effectively cut or severed.

From the foregoing, it should be readily appreciated that successful and proper functioning of the cutting mechanism **32** (and thus also of cutting mechanism **30**) requires control over the intervals of time when there is light beam impingement upon the photocell **58**. Stated another way, it is desirable for proper functioning that the photocell **58** be covered, in this instance by the blanks **14** during the interval of operation when it is desired not to operate the cutter **50**, and that photocell **58** be uncovered during the other interval of operation when it is desired to have a cutting stroke of the cutter **50**. The manner in which this is achieved is illustrated in FIGS. **2***a*—**2***e* which illustrate progressive positions of movement of the cloth blanks **14** with respect to the photocell **58** embodied in the free end of the cutting plate **62**.

FIG. **2***a* illustrates the assumed starting position of the cycle of operation of the cutting mechanism **32**. In this starting position, chain thread **12** adjacent the photocell **58** is severed and the cutter **50** and light beam **60** will be understood to have been cranked to their rearward positions, as illustrated, in which light beam **60** is behind the photocell **58**.

From the starting position depicted in FIG. 2*a*, simultaneous operation of the conveyor **24** and of the crank mechanism **44** results in movement of both the blank **14** and of the light beam **60** in the feed direction **18**, the latter moving toward its forward crank position. This intermediate position is depicted in FIG. 2*b* wherein it will be noted that movement of the light beam along the path which crosses over the photocell **58** nevertheless does not operate the photocell circuit **54** because at the time of passage of the light beam over the photocell **58** the blank **14** is in a covering position over the photocell **58**.

Ultimately, the cutter **50** and the light beam **60** are urged to their forward crank positions as depicted in FIG. 2*c*. In this position, the light beam **60** is now in front of the photocell **58**. Moreover, feed movement **18** of the conveyor **24** is conducted to an extent which carries the trailing edge **20** of a blank **14** beyond the photocell **58** and is terminated just prior to the leading edge **22** of the next succeeding blank **14** reaching the photocell **58**. Thus, the photocell **58** is within an opening created between the blank trailing and leading edges **20** and **22**, respectively. It should further be noted that in the creation of the opening **64** that the chain thread **12** connecting the edges is placed in an advantageous taut condition. This taut condition, in turn, is effective in providing as wide an opening **64** as is possible to provide between the blanks **14** and also in aligning the chain thread **12** beneath the transversely oriented cutting edge of the cutter **50**.

Chain thread **12** between the successive blanks **14** is now in an advantageous position for severing or cutting. This cutting, moreover, automatically occurs upon the cranking of the cutting mechanism **32** in a counterfeed direction **36** while operation of the conveyor **24** is temporarily halted, all as is clearly illustrated in FIGS. 2*d* and 2*e*. Specifically, during counterfeed movement **36** of the cutting mechanism **32**, light beam **60** is moved across the uncovered photocell **58** and results, in the manner already noted, in a cutting stroke of the cutter **50**. This cutting stroke occurs swiftly and at a time when the cutter **50** is over the chain thread **12**. As illustrated in FIG. 2*e*, ultimately the cutter **50** and light beam **60** are cranked to a rearward position in which the light beam **60** is moved beyond the photocell **58** which permits return spring lifting of the cutter **50**. It should be recognized that the FIG. 2*e* positions of the cutter **50** and light beam **60**, as well as the condition of the disconnected successive pair of blanks **14** are similar to that depicted in FIG. 2*a*, which was the assumed starting condition of the cutting operation of the cutting mechanism **32**.

From the foregoing description it should be readily appreciated that each of the cutting mechanisms **30** and **32** effectively sever chain thread **12** interconnecting successive blanks **14** while the chain thread **12** is in an advantageous taut condition and, further, while a maximum opening **64** exists between the blank trailing and leading edges **20** and **22**, respectively. As a consequence, it is possible, if it is desired to do so, to not only sever the chain thread **12** but also to achieve a trimming function. That is, if the circumstances warrant it, the chain thread **12** can be cut at two locations rather than in the single medial location as illustrated herein. These two locations, moreover, can be respectively adjacent the edges **20** and **22** so that in the process of severing the chain thread **12** there are no length portions thereof which require trimming from the blanks **14**.

A latitude of modification, change and substitution is intended in the foregoing disclosure and in some instances some features of the invention will be employed without a corresponding use of other features.

What I claim is:

1. A device for severing thread interconnecting cloth blanks comprising a conveyor operatively arranged to transport plural cloth blanks in a prescribed feed direction, at least two adjacent ones of said cloth blanks having a connecting thread joining the respective trailing and leading edges thereof, a thread severing mechanism including a reciprocating cutting implement and control means for said mechanism operatively effective to simultaneously actuate both said conveyor and said thread severing mechanism through said feed direction to provide an opening between said respective trailing and leading cloth blank edges of an optimum extent and subsequently to actuate said thread severing mechanism in a reverse direction through said counterfeed direction across said opening to thereby cause the severing of said connecting thread by said cutting implement thereof.

2. A thread severing device as defined in claim **1** wherein said thread severing mechanism includes a photocell circuit operatively effective to selectively cause a cutting stroke of said cutting implement.

3. A thread severing device as defined in claim **2** including a crank mechanism operatively connected to actuate said thread severing mechanism in said feed direction and subsequently in a reverse counterfeed direction during which said photocell circuit is operatively effective to sense the presence of said opening between said blanks beneath said cutting implement.

4. A thread severing device as defined in claim **3** wherein said photocell circuit includes a light source carried by said thread severing mechanism and a light-actuated switch located along the path traversed by said thread severing mechanism during said counterfeed movement thereof.